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# Apparatus for Dressing, Turning, and Moulding Stone, &c.

LETTERS PATENT to John Dickinson Brunton of Great George Street in the City of Westminster for an Invention of "IMPROVEMENTS IN APPARATUS FOR DRESSING TURNING AND MOULDING STONE AND THE LIKE." Partly a communication by Frank Henry Julius Trier, at present residing at Boston, United States of America.

PROVISIONAL SPECIFICATION left by the said John Dickinson Brunton at the Office of the Commissioners of Patents on the 1st February 1882.

JOHN DICKINSON BRUNTON of Great George Street in the City of Westminster "IMPROVEMENTS IN APPARATUS FOR DRESSING TURNING AND MOULDING STONE AND THE LIKE" Partly my own Invention and partly the result of a communication to me by Frank Henry Julius Trier at present residing at Boston United States America

The said Invention consists firstly in the application of circular rotating cutters to the planing shaping or turning of stone in such a manner as to cause the edge of the cutter to shave pare or slice away as distinguished from splitting off or arroding the portion of stone intended to be removed.

In order to accomplish this the cutter or cutters is or are placed in such a position with regard to the stone as to form the surface upon which the paring action takes place in the substance of that part of the stone which it is the object of the operation to remove :—

The cutter or cutters is or are placed at a greater or less skew to the plane of motion and as a result of this skew the surface formed by the edge of the cutter will be more or less concave.

The angle of the chord of the concavity to the resulting adjacent (which may be called the dressed) surface of the stone may also be varied to suit the requirements of different classes of work by varying the inclination of the cutter or cutters :—

Where the production of a concave surface by the cutter is the particular object in view the skew of the cutter or cutters is increased to any extent that may be necessary and is within practical limits :—

The Invention consists further in mounting a circular rotating cutter or an axis or arbor carried in a socket (which I call the tool holder) to which an oscillating

or rocking movement can be imparted so as to give to the cutter the skew necessary for cutting in either direction by which means a stone can be operated upon when travelling in both directions. The tool holder is constructed to hold either the single cutter or the combined cutters herein described

The Invention consists further in mounting a circular cutter on an arbor carried in an adjustable socket fitted to a slide rest which moves round a circular or segmental slide which circular or segmental slide has also a compound slide motion the cutting edge of the cutter being so placed as to be in or near the centre of the said circular or segmental slide so that the said cutter being adjusted with the necessary skew can be moved (by the travel of the said slide rest on the segmental slide) in a circular path to operate upon the stone.

The Invention consists further in employing two or more cutters inclined towards each other so as mutually to relieve each other, and be able to cut or shear out a groove. These cutters may or may not be exactly opposite to each other and may be mounted on the same or different holders.

The Invention further relates to apparatus for turning grindstones:

Firstly in the case of grindstones pierced with a central hole and mounted on a shaft or spindle for the purpose of being turned :—

On each side of the stone to be turned is placed a frame commonly of wood or iron in which are fixed V slides or the frames may themselves be the V slides. On these slides are mounted slide rests carrying circular rotating cutters—and by screws or other well known means there is given to these slide rests a rectilinear and by preference self acting movement parallel to the sides of the stone and by means of the circular cutters the two sides of the stone are dressed as it revolves on its axis.

In order to allow of the more ready placing and removing of the stone the outer of the two frames is hinged so that it can be swung out of the way. A third similar cutter is employed mounted on another slide rest having a movement across the edge or periphery of the stone and while the two cutters already described dress the flat sides of the stone this third cutter can be brought into action to dress or turn the edge of the stone to a true and cylindrical face. The slide in which this slide rest is carried is also hinged so that it can be thrown back out of the way for the greater convenience of putting a stone on to its shaft or taking it off

Secondly in the case of grindstones without a central hole.

The stone to be dressed is placed on a horizontal revolving table and there is brought down on the centre of the stone so placed a rotateable clamp by which it is securely held down on the table and will revolve with it. Above the table there is fixed a horizontal slide carrying a slide rest on which is mounted a circular cutter and while the stone revolves the cutter is caused to dress the flat surface thereof. Upon a vertical slide is placed another slide rest carrying a circular cutter with which the periphery of the stone is turned or dressed. When one side is dressed the stone is turned over and the other side is dressed in a similar manner:

Ordinarily it will be found more convenient to turn or dress the edge of the stone under this arrangement only part way down or across and finish when the stone is turned over for the second side :—

The Invention relates further to an arrangement of machine adapted for applying circular cutters to the production of arrises, plane surfaces and straight and curved moulding :—

The machine is constructed with two or more standards against the face of which is placed a horizontal slide ; which by screws or other suitable means, can be raised or lowered for adjustment. Upon this horizontal slide is placed a compound swivelling slide and upon it the rocking tool holder hereinbefore described, or if it is intended to use the machine also for mouldings, a simple slide on which is placed the circular or segmental slide hereinbefore described and upon it either a simple or a compound swivelling slide carrying the rocking tool holder :—

It is preferred to move the stone to and fro rather than the cutters. For this purpose the stone is placed on a table moving on slides and having also wheels on which it may travel when out of the machine for convenience of transport.—The table receives a reciprocating motion by toothed gear or any other convenient means:—

In order to produce curved mouldings or surfaces there is placed on the ordinary table of the machine which receives a rectilinear motion only a second table which though carried forward by the lower table as it moves to and fro is free to slide about upon it, and to receive a motion curvilinear, or diagonal to that of the lower table

To produce surfaces or mouldings which shall be arcs of circles this upper table is attached by means of an arm, or by links or radius rods to a fixed centre, and thereby constitute it a species of sector. The reciprocating movement communicated to it by the lower table will thus be converted into a circular movement round the fixed centre, and the stone fixed upon this upper table will be dressed or shaped in form of an arc.

The distance of the fixed centre from the upper table is varied so as to produce curves of varying radius; and means are or may be provided for changing the position of the fixed centre at any desired point in the arc so as to continue the curve at a greater or less radius. Also similar links, arms or radius rods are or may be placed on the other side of the table and means may be provided for the disengagement of the radius rods or other attachment on one side and for simultaneous engagement of those on the other side by the combined operation of which an **S** formed curve will be produced

SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said John Dickinson Brunton in the Great Seal Patent Office on the 26th July 1882.

JOHN DICKINSON BRUNTON of Great George Street in the City of Westminster "IMPROVEMENTS IN APPARATUS FOR DRESSING TURNING AND MOULDING STONE AND THE LIKE." Partly my own Invention and partly the result of a communication to me by Frank Henry Julius Trier at present residing at Boston United States of America.

The said Invention consists firstly in the application of circular rotating cutters to the planing shaping or turning of stone in such a manner as to cause the edge of the cutter to shave pare or slice away as distinguished from splitting off or arroding the portion of stone intended to be removed—In order to accomplish this the cutter or cutters is or are placed in such a position with regard to the stone as to form the surface upon which the paring action takes place in the substance of that part of the stone which it is the object of the operation to remove. The cutter or cutters is or are placed at a greater or less skew to the plane of motion and as a result of this skew the surface formed by the edge of the cutter will be more or less concave. The angle of the chord of the concavity to the resulting adjacent (which may be called the dressed) surface of the stone may also be varied to suit the requirements of different classes of work by varying the inclination of the cutter or cutters—Where the production of a concave surface by the cutter is the particular object in view the skew of the cutter or cutters is increased to any extent that may be necessary and is within practical limits.

The Invention consists further in mounting a circular rotating cutter on an axis or arbor carried in a socket (which I call the tool holder) to which an oscillating or rocking movement can be imparted so as to give to the cutter the skew necessary for cutting in either direction by which means a stone can be operated upon when travelling in both directions—The tool holder is constructed to hold either the single cutter or the combined cutters hereinafter described.

The Invention consists further in mounting a circular cutter or an arbor carried in an adjustable socket fitted to a slide rest which moves round a circular or segmental slide which circular or segmental slide has also a compound slide motion the cutting edge of the cutter being so placed as to be in or near the centre of the said circular or segmental slide so that the said cutter being adjusted with the necessary skew can be moved (by the travel of the said slide rest on the segmental slide) in circular path to operate upon the stone.

The Invention consists further in employing two or more cutters inclined towards each other so as mutually to relieve each other and be able to cut or shear out a groove. These cutters may or may not be exactly opposite to each other and may be mounted on the same or different holders.

The machine for applying circular cutters to the production of arrises, plane surfaces and straight and curved moulding is or may be constructed with two or more standards against the face of which is placed a horizontal slide, which, by screws, or other suitable means can be raised or lowered for adjustment. Upon this horizontal slide is placed a compound swivelling slide, and upon it the rocking tool holder hereinbefore described, or, if it is intended to use the machine also for mouldings, a simple slide in which is placed the circular or segmental slide hereinbefore described, and upon it either a simple, or a compound swivelling slide carrying the rocking tool holder. It is preferred to move the stone to and fro rather than the cutters.

For this purpose the stone is placed on a table moving on slides and having also

wheels on which it may travel when out of the machine for convenience of transport or the table may be provided with wheels only, running on suitable rails The table receives a reciprocating motion by toothed gear or any other convenient means.

In order to produce curved mouldings or surfaces there is placed on the ordinary table of the machine—which receives a rectilinear motion only, a second table, which, though carried forward by the lower table as it moves to and fro, is free to slide about upon it, and to receive a motion curvilinear or diagonal to that of the lower table.

To produce surfaces or mouldings which shall be arcs of circles this upper table is attached by means of an arm, or by links, or radius rods to a fixed centre, and thereby constitute it a species of sector.

The reciprocating movement communicated to it by the lower table will thus be converted into a circular movement round the fixed centre, and the stone, fixed upon this upper table will be dressed or shaped in the form of an arc.

The distance of the fixed centre from the upper table is varied so as to produce curves of varying radius, and means are or may be provided for changing the position of the fixed centre at any desired point in the arc, so as to continue the curve at a greater or less radius. Also similar links, arms or radius rods are or may be placed on the other side of the table, and means may be provided for the disengagement of the radius rods or other attachment on one side and for a simultaneous engagement of those on the other side by the combined operation of which an S formed curve will be produced.

The Invention further relates to apparatus for turning grindstones. On each side of the stone to be turned is placed a frame commonly of wood or iron in which are fixed V slides or the frames may themselves be the V slides—On these slides are mounted slide rests carrying circular rotating cutters—and by screws or other well known means there is given to these slide rests a rectilinear and by preference self acting movement parallel to the sides of the stone—and by means of the circular cutters the two sides of the stone are dressed as it revolves on its axis.

In order to allow of the more ready placing and removing of the stone the outer of the two frames is hinged so that it can be swung out of the way. A third similar cutter is employed mounted on another slide rest having a movement across the edge or periphery of the stone and while the two cutters already described dress the flat sides of the stone this third cutter can be brought into action to dress or turn the edge of the stone to a true and cylindrical face. The slide in which this slide rest is carried is also hinged so that it can be thrown back out of the way for the greater convenience of putting a stone on to its shaft or taking it off.

And in order that the said Invention may be fully understood I shall now proceed more particularly to describe the same and for that purpose shall refer to the several figures in the annexed Sheets of Drawings.

Figures 1 and 2 are views at right angles to each other of a circular rotating cutter arranged in such a manner as to cause the edge of the cutter to shave pare or slice away as distinguished from splitting off or arroding the portion of stone intended to be removed.

In order to accomplish this the cutter (or both or all of the cutters where two or more are used) is or are placed in the position relatively with the surface of the stone or the like to be operated upon as to form the surface upon which the paring action of the cutter or cutters takes place in the substance of that part of the stone which it is the object of the operation to remove, *videlicet*, that marked *x* in the said Figures 1 and 2.

The surface formed by the edge of the cutter will be more or less concave according to the "skew" to the plane of motion to which the cutter is adjusted. The angle of the cut to the resulting dressed surface (*y* in the said Figures), will be in accordance with the degree of inclination to which the cutter is adjusted. The tool or cutter will be held in a holder and will be adjustable

therein to alter the "skew" or the inclination by means essentially resembling those herein described for a like purpose. Figure 3 represents a cutter arranged with a "skew" according to this part of the Invention for cutting a circular moulding—A represents the stone to be turned which is supported on suitable lathe centres one of which is shewn at B. The circular cutter C is fixed by means of the bolt D to a hollow spindle E which is supported so as to be free to revolve in the holder F which is provided with a cylindrical stem or support G working in a socket $G^1$ in such a manner as to enable the holder F and cutter C to be turned bodily upon the said stem or support. The object of this arrangement is to enable the cutter to be readily placed at such an angle to the stone as shall produce the concave surface desired The socket $G^1$ in which the stem G works and which forms part of an ordinary slide rest is also capable of travelling in any required direction in order to enable the cutter to be fed forwards in the usual manner and to be brought to work on any part of the stone. The stone A revolves in the direction of the arrow *a* marked thereon in the Drawing and the cutter C is thereby caused to revolve in the direction indicated by the arrow *b*. The round or cylindrical stem G of the cutter holder F being capable of rotating in its supporting socket $G^1$ as hereinbefore described enables the cutter to be adjusted in such a manner as to cause the edge of the said cutter to be presented to the stone at the most favorable angle for producing the required Concave surface as shewn in the Drawing it being fixed in the position to which it has been brought by the set srcew *g*

This arrangement of cutter holder or support is also applicable to cutting or shaping stone in other than turning operations. Such for example, as forming straight or curved mouldings as illustrated in diagram in Figure 4. Figure 5 represents an arrangement according to the first and a further part of the Invention for performing the operations of cutting grooves forming internal angles or internal parts of mouldings and of roughing out as applied to turning.

A represents the stone to be operated upon which is mounted on suitable lathe centres one of which is shewn at B Two Circular cutters C are carried upon spindles D so as to be free to turn thereon and are arranged in such a manner as to revolve in planes inclined to one another and also forming an angle with the axis or with the original surface of the stone. The spindles D are carried by a holder E capable of being moved so as to hold the cutters up to the work in a manner similar to that hereinbefore described and a scraper *d* is provided between the cutters for the purpose of preventing the edges from becoming clogged or a jet of water or blast of air can be employed for the same purpose. The stone A revolves in the direction of the arrow marked thereon in the Drawing and the cutters C are thereby caused to revolve in the opposite direction and split or shear off the portion of stone situated between them By their combined action the cutters mutually assist each other in this operation and any undue breaking away of the surface of the stone is thereby prevented whilst a clean cut groove or V shaped recess is produced with great facility. The cutters may be adjustable as hereinafter described.

Figures 6 and 7 show in elevation at right angles to each other another arrangement according the said Invention. Figure 8 is a general diagramatic view of the arrangement of the machine. A and B represent an arrangement of Double slides worked respectively in directions at right angles to each other by handles at *a* and *b* the handle at *a* operating the worm $a^2$ and worm wheel $a^3$ carried in the nut $a^4$ and causing the longitudinal movement of the slide A along the screw $u^2$ and guides on the bed *u*—The hand wheel *b* operates the screw $b^2$ and causes it by travelling in the nut $b^3$ fixed to the slide A to move the slide B in the said slide A. On the slide B is cast the segment of a ring S which forms a guide to and attachment for the circular segmental slide C. In order to increase the length of this slide C in either direction it can move on the segment S and can be clamped in its adjusted position by means of screws *s s*. The segment D slides on the slide C and is moved by means of the worm W held between ears $w^2$ cast upon the

segment D the said worm W gearing with the worm rack W¹ The segment D carries cheeks E E between which the tool holder F can rock on trunnions T T. This Toolholder F is a hollow cylindrical piece split at its lower end being there provided with a clamping screw *f* for tightening it upon the toolholder stem G which can be moved up and down in F by means of the screw H which is attached to the stem G in such a manner that the said stem G can be turned round on its axis without affecting the screw H this attachment is shewn clearly in dotted lines in Figure 6 The stem G can terminate in a variety of ways according to the form of the tools employed Examples are shewn in Figures 5, 9. 10 and 11.

The double tools shewn in Figure 6 (in which cone cutters are shewn) are placed close together for cutting out or finishing angles after the manner described with reference to the arrangement Figure 5. A scraper or jet of water or blast of air should be used to clear the interval between the tools as described with regard to the said figure 5, By bringing the acting parts of the Cutters nearer to or further from the centre of the segmental slide C the circular members of mouldings of any radius for which the machine is adapted may be produced by movement of the segment D round about the segmental slide C. This is illustrated by Figures 6 and 9 where *x* will be the centre both of the desired moulding and of the segmental slide C. The dot and pick lines $x^2$ $x^3$ are the radii of segmental slides forming arcs of circles of different diameters with which the machine may be provided Figure 11 shows a modification of the stock or stem G carrying the double cutters—this Figure also showing a plan of the holder $g^2$ It is furnished with two moveable cutter holders $g^1$ $g^2$ each consisting of two slide checks and a cross piece which carries the trunnion *d*. The long bolt holes in both the stock and the cheeks of the holders permit of the said holders being adjusted to a variety of angles and distances relatively to each other so as to suit the work to be done thereby and also to bring together the edges of the cutters when they are diminished in diameter by wear. If it be desired that the Cutters be not exactly opposite to one another the trunnions *d* may have a position to one side of the central line *x y* One cheek of each of the Cutter holders is formed as shown at $g^1$ and one cheek of each Cutter is formed as shewn at $g^2$ The upper bolts *a a* pass through both cheeks in the case of both $g^1$ $g^2$ but the lower bolts *b b* hold only by one cheek of each Cutter holder and the heads of these bolts *b b* are sunk in a square recess *c* formed in the stock In this form of Holder the Cutter runs freely on the trunnion *d* and is held in place by the screw and washer *e* one cutter only being shown in place in the Drawing.

Again referring to Figures 6 and 7 the rocking action takes place both ways to allow cutting on the backward and forward movement of the stone and is limited by means of projections P P on the holder F which rock between stops *p p* on the cheeks E E. A method is shewn of giving the cutters this rocking motion automatically — One of the cheeks E has two projections which carry the rollers R R which can turn in direction round the centres K K. A cord is passed over the rollers and is fixed to one of the projections P at *m*. The said cord passes twice round a pulley M which can slide to and fro on an over head shaft Q to follow the motion of D the weight *w* keeping the cord tight the rollers R R will always remain perpendicular and the pulley M will follow the movement of the segment D. By giving the shaft Q first a turn one way and then the other by any convenient means connected with the backward and forward motions of the table the desired rocking can be obtained alternately bringing the holder into the positions indicated by the dotted centre lines passing through T in Figure 7. The edges of the Cutters are shewn in Figures 6 at the centre of the segment c but can be drawn back out of the said centre and their cutting edges be caused to describe a circle of any required radius to operate upon work of any diameter which the machine will accommodate.

Figure 9 shews a single cutter attached to the stem G especially suitable for Granite and the working of similar stones The Cutter can be brought into the position indicated by the dotted lines at P¹ by turning the stem through 180°

The said Cutter is shown drawn back out of the centre $x$ of the segmental slide C. as before mentioned and as describing a circle whilst splitting off the stone.

Figure 10 shews a Cutter with its plane passing through the axis of the stem G. A partial rotation of 180° of the stem in the tool holder will bring the Cutter into the position indicated by the dotted lines and by partially turning the stem G the Cutter can be brought into such a position that its edge shall produce any desired concave hollow of a moulding for example as illustrated in Figure 4.

Figures 13 and 14 show another form of attachment of the tool for the double slide The stem G of the tool holder is in a corresponding bearing in the socket X and can be taken out and placed in the socket $X^1$ to operate in another direction upon the stone. The cutter can move round in a circle on the swivel plate as the toolholder of an ordinary planing machine Z Z are the screws for attaching to the machine. Instead of rocking the Cutter (as in Figures 6 and 7 to produce the tilt it is produced by a turn either way round the axis G which terminates in a square which carries the plate J which has two or more notches N (see Figure 14) so that it can turn within certain limits the pin $K^2$ acting as a stop. It will be readily understood that this motion can easily be made automatic by any suitable device from a convenient part of the machine By shifting the plate J through 90° so as to bring the other notch N opposite the pin $K^2$ the cutter can be brought into the position indicated at $P^2$ When in the position $P^1$ its plane is in the direction of the movement of the table but in the position $P^2$ it works at right angles to the movement of table and in this latter position would serve to square or mould the end of the stone. In this latter case the stone will be stationary and the cutter will move backwards and forwards.

Two toolholders can be mounted on the cross slide U so as to operate at the same time on two sides of a stone.

Figure 15 represents in elevation and Figure 16 in plan an arrangement of table which I add to the moulding machine as arranged for the production of straight mouldings or arrises in order to produce curved mouldings or arrises. I place on the ordinary table B an upper table A I fix upon this table B a pin $a$ and in the underside of the table A is a slot $a^2$ extending nearly all across it the said slot being fitted to the pin $a$ Thus as the table B moves longitudinally the table A is carried forward to and fro thereby—but is free to slide about upon it To the side of the table A I attach a bar or radius rod C having a slot $c^2$ along a great part of its length I fit to this slot $c^2$ a pin $b$ which can be fixed at any point of the slot $c^2$. by the binding nut $c$ screwing on the said pin $b$. The said pin $b$ enters into a hole in the sliding piece $e$ Around the pin $b$ as a pivot the table A will turn when carried to and fro by the lower table B and a stone fixed on the said table A will be formed into a curved face or moulding by the action upon it of the cutter or cutters arranged and mounted essentially as already described with regard to the cutter or cutters for straight mouldings By means of the screw $d$ the sliding piece $e$ can be adjusted so as to vary the distance of the pin $b$ from the table A and thus obtain any desired radius of curve in the moulding produced by the machine. By arranging a similar radius rod at the other side and providing any convenient means of disengaging the attachment on one side or the other and engaging the other by the action of the two one after the other an S form of curve may be produced There may be guides provided for the table B at a position as at $x$ in Figure 16 so that the said table may be placed thereon and thus be brought nearer to the centre pin $b$ for the purpose of producing curves of a radius smaller than can be produced otherwise. The slot $c^2$ is long enough to permit of the radius rod C being moved back over the pin $b$ when this position on $x$ is adopted

Figure 17 represents in elevation Figure 18 in plan and Figure 19 in end view a machine for turning circular slabs or discs of stone such as grindstones Figures 20 to 23 are details as hereinafter described.

A represents the stone being turned It is placed on the projecting extremity of the shaft H and fixed thereon by clamping plates $g$ $g$ and the nut $h$ The framing of the machine consists of side beams G $G^1$ and end pieces I $I^1$ the front beam G

being moveable for the purpose of inserting and removing the stone When the said beam is in place it rests on the end beams I $I^1$ as shewn and is held in place by nuts or cotters on the ends of the bolts *f* At one end of the framing is fixed by bolts or screws a bed bed plate J with lugs which carry the shaft *c* having thereon worms *k* engaging with worm wheels *a a* upon the ends of the screws *b* These screws being respectively carried by beds E $E^1$ bolted at one end to the side beams and at the other end to the plate J The holes on the plate for the bolts securing the bed E are slotted to allow of the position of the said bed being adjusted to suit different thicknesses of stone. In each bed E $E^1$ are V grooves in which the tool holders B B move longitudinally the said tool holders running upon the screws *b b* The bed E is hinged by the lug *n* to the shaft *c* so that when the bolts by which it is fixed to the bed plate J and the frame G are removed the said bed can be swung up and out of the way during the removal or insertion of a stone The shaft H is driven by any suitable motor and from this shaft by means of the band pulley thereon, the band D, and the fast band pulley on the shaft *c*, motion, is through the worms *k* gearing with the wheels *a*, given to the screws *b*, to give the requisite longitudinal traverse to the cutter holders B.

For the purpose of turning the periphery of the stone a toolholder and tool is arranged to traverse across the other end of the frame, the said holder running on the screw *l* and in V grooves carried by the slide bed L, which bed is adjusted in grooves in the double bed piece F, nearer to or further from the centre of the Machine, to suit stones of various diameters This double bedpiece F has lugs V which are hinged upon a rod *e* supported by eyes *t* fixed to the bed so that the said bed piece F may be turned upon this hinge to be out of the way during the removal or insertion of a stone The said bedpiece F is secured to the frame by bolts *s s* in the frame having ordinary or fly nuts, the washers $s^1$ thereof being elongated, and the bolts passing through corresponding holes in the said bed F so that on slacking the nuts, the washers $s^1$ can be turned into a position with their length in line with the length of the holes, to allow the bedpiece F to be readily raised when required. Figure 20 is a transverse section of one side of the framing with one of the sides of the bedpiece F

Figure 21 represents in longitudinal section, Figure 22 in end elevation, and Figure 23 in plan, one of the tools or cutters, and its holder which I prefer to use. The cutter (or cutters) *m* is or are firmly fixed to the cylinder N by means of the bolt P and nuts Q The said cylinder N is capable of freely turning in the tubular piece R, which is capable of adjustment longitudinally in the holder or socket T by means of the screw O

This socket T is capable of turning on a vertical axis or gudgeon, which takes into the circular recess at U and is upon the part of the holder which runs upon the screws *b* or *l* Figure 18. Bolts W taking into curved slots in this last mentioned part secure the part T in the position to which it has been brought.

Thus by this means the cutter *m* can be set at any angle with the face of the stone, whilst by means of the screw O the depth of cut can be readily adjusted.

Having now described and particularly ascertained the nature of the said Invention and the manner in which the same is or may be used or carried into effect, I would observe in conclusion, that what I consider to be novel and original and therefore claim as the Invention secured to me by the hereinbefore in part recited Letters Patent is

First—The use in machines for dressing turning or moulding stone and the like of a cutter or cutters so arranged or skewed as to dress the stone or the like by paring away or slicing off the portion to be removed the said cutter or cutters making their cut or forming the surface upon which the paring or slicing action takes place in the portion of the stone or the like which it is the object of the operation to remove substantially as described with reference to Figures 1. 2. 3. 4 and 5 of the accompanying Drawings

Second.—The combination of two revolving cutters arranged opposite to or nearly opposite to and at an angle with each other and to the surface of the stone

or the like substantially as and for the purpose hereinbefore described with reference to Figures 5. 6 and 11 of the accompanying Drawings

Third The machine for cutting and shaping or moulding Stone and the like in a curved direction constructed or arranged substantially as hereinbefore described and illustrated in Figures 6. 7 and 8 of the accompanying Drawings.

Fourth—The arrangement of holder of the cutter or cutters and means for traversing it substantially as hereinbefore described and illustrated in Figures 6. 7 and 8 of the accompanying Drawings.

Fifth—Mounting a circular rotating cutter or cutters on an axis or arbor carried in a socket to which an oscillating rocking movement can be imparted to give the cutter or cutters the requisite skew for cutting whilst the Stone or the like is travelling in either direction substantially as hereinbefore described with reference to the accompanying Drawings

Sixth—The arrangement for rocking the cutter or cutters for the Cut in both directions substantially as hereinbefore described and illustrated in Figures 6, and 7 of the accompanying Drawings.

Seventh. The combination in machines for cutting or dressing stone and the like into curved mouldings or forms of the arrangement substantially as hereinbefore described with reference to Figures 15 and 16 of the accompanying Drawings whether one or two radius rods be used and whether or not there be combined therewith the extra track *x*

Eighth The machine for turning or dressing grindstones or other discs or circular slabs of stone and the like the said machine being constructed or arranged substantially as hereinbefore described and illustrated in Figures 17. 18 and 19 of the accompanying Drawings whether constructed to act on the side or sides only or both on the side or sides and on the periphery of the said stone or the like.

Ninth—In machines for turning or dressing grindstones or other discs or circular slabs of stone and the like arranging the parts of the machine so that they can be readily turned out of position for the removal and insertion of the stone or the like to be operated upon substantially as hereinbefore described and illustrated in Figures 17. 18 and 19 of the accompanying Drawings

Tenth. In machines for turning or dressing grindstones or other discs or circular slabs of stone and the like the means substantially as hereinbefore described and illustrated in Figures 17. 18 and 19 of the accompanying Drawings for adjusting the cutter or cutters to the size of the stone or the like to be cut or dressed.

In witness whereof I the said John Dickinson Brunton have to this my Specification set my hand and seal the Seventeenth day of July One thousand eight hundred and eighty two.

JOHN DICKINSON BRUNTON. (L.S.)

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